EPA's Indoor Air Quality Tools for Schools (IAQ TfS Program

WEB CONFERENCE

Leading Edge IAQ TfS Assessment Strategies
Tuesday, April 24, 2007, 1pm-3pm EDT

Background

The Environmental Protection Agency (EPA) developed the *Indoor Air Quality (IAQ) Tools for Schools (TfS)* Program to reduce exposures to indoor environmental contaminants in schools through the voluntary adoption of sound indoor air quality management practices. In this two-hour Webinar, *IAQ TfS* award winners shared how EPA's *IAQ TfS* guidance helped to assess their school facilities regularly to detect potential problems before becoming larger IAQ issues.

Featured Speakers

Tracy Enger,
Environmental Protection Agency, Wash., DC

Dave Blake, Indoor Air Specialist
Northwest Clean Air Agency, Washington

Aston Henry, Department of Risk Management
The School Board of Broward County, Florida

Dave Hill, Exec. Director, Facilities & Operations
Blue Valley School District, Kansas

Rich Prill, Building Science and IAQ Specialist
Washington State University, Washington

Theresa Coleman, Dept. of Risk Management
The School Board of Broward County, Florida

Introduction: Tracy Enger

Tracy Enger opened the discussion by placing IAQ assessment into context. Assessment of IAQ is an ongoing and interactive process in schools. A robust IAQ management program should include continuously assessing the environment; communicating with everyone; organizing stakeholders for success; evaluating results for improvement; planning short term and long term activities; and acting to address structural, institutional, and behavioral issues. These phases are intertwined and constantly evolving. Webinar participants took the first step toward developing a comprehensive IAQ management program by joining this session to learn from some EPA award winning experts on IAQ assessment in schools.

Polling Question: Have you participated in an IAQ assessment of a school? **Yes 72% / No 28%**

School Walk-Throughs: Rich Prill & Dave Blake

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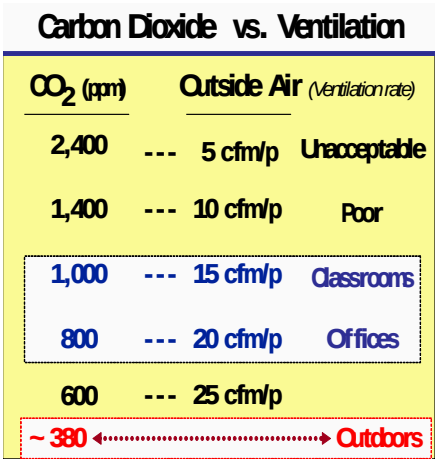
A walk through should be a routine part of an IAQ assessment plan that provides an opportunity to communicate and raise awareness among stakeholders about routine IAQ conditions and challenges. By involving all stakeholders – including administrators, you gain buy-in, while staff, students, and parents get positive messages about the school's proactive approach to IAQ.

Check

- √ Equipment is dry/ functions well.
- √ Filters fit tightly in slots.
- √ Rooms are clutter free.
- √ Crawl spaces & vents are unobstructed.
- √ All spaces are well ventilated.
- √ CO2 levels are appropriate.
- √ Air flow moves from clean to dirty.
- √ Animals are visitors, not permanent residents.

Pre walk-through activities. Work with administration for buy-in and "gently" sell the idea. Be prepared to take baseline measurements, because you cannot improve what you do not measure. When beginning walkthrough look at it as an opportunity and be careful not to alarm faculty or students. Visit the school during occupied hours to allow insight into actual building operation.

Keep the approach simple and don't overreact. Look for the day-to-day concerns, use tools and resources that are at hand, and develop a practical plan for addressing concerns. The worst thing you can do is NOTHING.



Understand proper ventilation. Air should move from clean (positive pressure) to dirty (negative pressure). The air brought in from outside should move from "clean rooms" such as academic classrooms to rooms high in pollutants such as art and shop classrooms as well as custodial and maintenance areas; boiler, work, locker, and rest rooms. All rooms should have adequate ventilation, defined as cubic feet per minute of fresh air per person. Classrooms should take in 15 cubic feet per minute (cfm/p), while offices should average 20 cfm/p. Carbon dioxide (CO2) is also used to estimate the ventilation rate. It provides documentation for a baseline in routine monitoring of fresh air intake. For a reference to CO2 levels, check outside air levels, which should average about 380 parts per million (ppm).

Start Outside. Indoor air quality is "outside plus". In other words, begin your IAQ assessment with the outdoor air quality. This will help to determine if the pollutants are generated indoors or are being brought in from the outdoors. Observe external sources, such as factories, along with air intakes and exhausts. During the walkthrough, visit the rooftop to identify potential water entry points and learn about rooftop mechanical equipment. Check for all potential wet sources that could eventually lead to mold growth.

Visit inside spaces. Investigate attic spaces unintended openings, HVAC drip pans, and for evidence of rodent/bird infestation, such as bat droppings. When inspecting inside spaces, you should investigate ducts and crawlspaces for leaks and mold.

All outdoor entries should be checked for proper drainage of outside contaminants and should include a walk-off mat. Check offices and classrooms for chemicals, animals, and evidence of moisture. Investigate workspaces for un-vented copiers and laminators. Storage areas should be checked for airflow (clean to dirty) and for proper storage of dangerous chemicals and materials. Investigate HVAC and mechanical areas for airflow (clean to dirty), check filters for tightness and ensure drip pans are clean and dry. Check maintenance closets for clues on cleaning techniques, equipment and chemicals. Check classrooms for cleanliness', overall thermal comfort, presence of pollutants or hazards materials, check unit ventilators and CO2 levels.

Involve

- √ Faculty and staff; they know the school better than anyone else.
- √ Parents and students, they care about their environment and will appreciate your efforts.
- √ District staff, administrators, and leadership; they will be part of the solution.

Document and summarize findings. Identify the actions that can be successfully implemented both in the short term and long term and keep progressing. Some items can be fixed on the spot. Simple solutions may include placing door mats at entryways to catch the dirt before it enters the building. Most importantly, document and reinforce good practices.

Customize your IAQ program. Developing a customized program will make your assessments easier, more effective, less expensive, and more personally rewarding.

Post walk-through activities. Communicate with key stakeholders. Meet with the principal, facility manager, and others to discuss both the good and the bad findings but most importantly emphasize the immediate risks. Utilize findings to integrate healthy practices into your IAQ plan.

School and school districts are encouraged to utilize the wide-range of resources that are available, including EPA Healthy Seat, IAQ Tools for Schools Checklists, the Virtual walk-through DVD.

Polling Question: Who participates in your IAQ assessments?

School Staff 53% **Consultants 26%** **District Staff 49%** **IAQ Team 51%**

Blue Valley Schools' Assessment Program: David M. Hill

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Develop a profile. Know and understand your school's environment. Develop an inventory list. Look for trends that can be documented. Quantifiable information is most useful when developing practical solutions; however, do not neglect subjective observations. Faculty, staff, and students often have visceral reactions to allergens and toxins that help to identify concerns. For example, a teacher may get headaches when working in particular areas of the building. A student may have unusual allergy attacks in a specific classroom.

Use objective, measurable data. Become proactive versus reactive. Data helps to develop public awareness and substantiate needs. There are many technological advancements that can help in data collection. You need not invest heavily in technology to conduct a successful walk through. Instead, prioritize your needs and use technology to assist with those priorities.

Create and adapt checklists for your Building Walkthrough. Check lists help to remind you about priorities for consideration. Use the EPA's IAQ TfS checklists, adapt them to your environment, or create your own. Checklists help create regularity in your walk-throughs. Use what makes the most sense.

Communicate with Stakeholders. It is not enough to be informed about assessments and the IAQ in your school. Building a good walk through means involving others, teaching them, developing leadership, and encourages public reporting of findings. Most importantly, once you have reported your findings, follow up! Tell people what you're going to do about the findings.

Polling Question: Is electronic technology used in your IAQ assessments?
Yes 71% **No 29%**

The School Board of Broward County, FL: Aston Henry & Theresa Coleman

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Broward County uses two response mechanisms to assess IAQ concerns: routine, annual assessment and on demand assessment.

Routine/Annual: Broward County conducts annual walk throughs to review IAQ in schools during the Fall months. A wide variety of people are involved in the process through initial surveys, walk through validation (Spring months), open communication of results, and plans for corrective action (Summer months). Like Blue Valley, Broward relies heavily on checklists to ensure the consistency of walk throughs.

On Demand: Immediate concerns about IAQ can be logged by anyone via telephone, email, or Web site. Using a carefully crafted IAQ response protocol, Broward County conducts walk throughs to validate, report, and correct IAQ concerns.

Innovative Record Keeping & Technology: Broward County uses common technology to facilitate innovations in walk throughs.

- Pocket PCs (aka PDAs) are used to transfer information immediately. Information gathered during the walk through is uploaded and sent to facilitate quick turn around of assessment, evaluation, and corrective action.
- Web based surveys are made available 24/7 to report concerns in IAQ.
- Reports, corrective action steps, and finings are uploaded to the school district's server to ensure consistency and sharing of information.

Polling Question: How do you rate the quality of your current IAQ Assessment Program?
High 4 = 22% **3 = 40%** **2 = 18%** **Low 1 = 20%**

Questions

1. **How does displacement air technology help in very humid environments?**

Nearly all schools currently use the mixed-airflow method for distribution and dilution of the air within the occupied space. Some designers are trying a method of ventilation known by displacement ventilation. Displacement ventilation systems are a unique air distribution system designed to maximize "ventilation effectiveness". This approach successfully uses natural convection forces to reduce fan energy and carefully lift air contaminants up and away from the breathing zone, thereby eliminating stale aire more completely than typical HVAC systems. Displacement ventilation systems use 100% dedicated outdoor air supply. They can work in humid environments, if they are designed and maintained properly. However, systems to dehumidify the air through the use of air conditioning and/or energy recovery ventilation systems must be in place. It should also be noted that displacement ventilation systems, with effective dehumidification can lead to very high energy costs (in order to dehumidify 100% of outdoor air).

2. **How do you use data consultants/equipment to measure /collect data?**

We use a machine called the Aircuity Optima 500. There is a website available to give you all of the details on what this machine can do - and it does a lot (www.aircuity.com). The added value of this machine is that it comes with the backing of a laboratory of industrial hygienists who analyze and interpret the results and issue a comprehensive PDF report based on the data that you collect through the machine and upload to them. The machine is not cheap – I believe a new Optima 500 cost in the neighborhood of $25,000. For that you get the machine and three years of unlimited access to Aircuity's industrial hygienist labs. We likely would have spent at least that amount in a three-year period on local industrial hygienists' fees without this machine. This system has the added benefit of a very quick turnaround/response time. What used to take us 2-3 week to sort out, interpret, and report back now takes us 2-3 days. That makes a big difference to us and our program. At the end of the three years, you can renew the contract with access to the Aircuity labs and their reports. It costs $15,000 for an additional three years. We have done this without hesitation. There is a lot of value to our district to do this. This solution might not make sense for a smaller district.

3. **Provide Information on a piece of equipment that measures CO2, CO, Temperature, ozone, radon, etc. Size, weight, cost, brand & accuracy**

I think the intrinsically inaccurate IAQ devices I have known have been purged from the marketplace. Any good instrument is only as good as its calibration. You can put together a low-cost, basic kit for just over $1000. The average cost of a CO2 only monitor for about $500. It will respond relatively slowly, but it works. Moisture meters to detect damp building materials, like drywall or ceiling tiles, start at about $150. I spent about $350 for a combination surface/pin device. Digital temp/relative humidity monitors with relatively rapid response are about $100. Individual CO real-time monitors are available for under $200. My CO monitor cost $500 but it has a hot probe to stick right into heated combustion gas streams. The Energy Conservatory in Minnesota sells chemical smoke tube kits (about $50) to check airflow direction. They also sell differential pressure gauges (about $600) to do the same. You have to be careful with chemical smoke (titanium tetrachloride). It is corrosive if packed with other equipment, sets off smoke alarms, is irritating in the face...you must know what you are doing and use it sparingly...then it is quite safe. I see no reason to measure ozone indoors. Reliable meters were about $8000 last time I checked and are suitcase-sized devices designed to measure outdoors

ambient ozone pollution. Radon is easy to test with kits (about $50 for two kits, including analysis, 1-800-air-chek is who I use).

Another way to go, if you can afford it, is to buy a hand held multi-function meter - CO_2, CO, Temp, RH (about $2500). There are several brands out there and it's the convenient way to go. Most will log data in all four parameters to produce graphs of changing levels over time.

4. **Our school district shuts off the system everyday at 4pm. What, if anything, does that do to the HVAC system? Does that cause moisture in the system that could cause mold or mildew?**

We never shut our HVAC systems off. Part of the reason is because most of them are used 16-18 hours per day. Also, depending on the situation and a number of factors, to shut them down and fire them back up could cost as much or more than running them at a consistent setting. Consider stop and go traffic versus running your car and the same speed over the same distance. You will get better gas mileage at a consistent speed. This is not ALWAYS true with HVAC systems, but it is true most of the time. The challenge to the energy manager is to find that individual building system's "sweet spot" for a nighttime set back point that minimizes energy usage, while at the same time maximizes comfort in the morning.

Our systems are always conditioning (heating, cooling, dehumidifying or humidifying) and circulating the air. Our CO2 monitors control the amount of fresh air introduced into the indoor environment. The CO2 level (and thus the number of occupants) tells the system how much fresh, outside air to draw in. Depending on the outside air temperature, this outside fresh air can be very expensive to condition. The less of that we have to do the less money we need to spend on energy.

5. **I would like to learn a little about Healthy Seat, and if it would be helpful for one school in a district, or would it be more effective if used in the entire district?**

EPA developed the Healthy School Environments Assessment Tool (Healthy SEAT) software tool to help school districts evaluate and manage their school facilities for key environmental, safety and health issues. Healthy SEAT is designed to be customized and used by district-level staff to conduct completely voluntary self-assessments of their school (and other) facilities and to track and manage information on environmental conditions school by school. Because Healthy SEAT was specifically designed to manage information about the status of environmental, health and safety issues across multiple school facilities so the tracking software component will not be useful to individual schools.

6. **I am considering a purchase of a probe to analyze chemical/fume concentrations in school lab areas. Do you feel this is a valuable asset to add to IAQ reporting? We work with a greywolf wolfsense IAQ-410 probe, pocket pc format and electrophysics hotshot XL thermographic camera, as well as smoke bottles and laser-measuring device.**

I have heard nothing bad about Greywolf IAQ probes; however, I have no personal experience. The infrared (thermographic) camera is on my wish list and has a host of useful applications for IAQ and energy conservation work. By laser measuring device I assume you mean a particle counter. We have them and are still trying to figure out what the numbers mean, but they are at least useful for assuring that HEPA vacuum exhausts are particle free and for comparing one carpet to the next, one couch to the next, inside to outside, etc.

7. Please suggest the most needed information to start a fledging IAQ program in a rural, low-populated region with a temperate climate.

1. Get the EPA's IAQ Tools for Schools kit. Read through it and decide what you want to use from it. Communicate to others in your district or school that you want to start an IAQ program and why.
2. Seek support and buy-in for the new program from the very highest levels you can.
3. Conduct an inventory assessment of what you have - building square footage, type(s) of building HVAC system, flooring types (carpet, tile, etc.), construction materials (drywall/sheetrock, concrete block, wood or metal studs).
4. Conduct a building walkthrough. Utilize the free information available to you in the EPA's IAQ Tools for Schools kit. Read it, learn it, and understand it to help you know what to look for in an IAQ building walkthrough.
5. If you lack funding for, or access to some of the basic assessment tools you'll need for your walkthrough, try your local university extension office to see if they might have some of those tools to borrow. They typically do.

If you take the initiative to proactively implement an IAQ program in your district BEFORE you have a major crisis, you are already well ahead of most districts.

8. Do you provide DVD's of walkthroughs to schools and what is the cost?

The DVD entitled "The Virtual School Walkthrough: Identifying and Solving Common Indoor Air Quality Problems" was developed by Rich Prill, Washington State University Cooperative Extension and Dave Blake, NW Clean Air Agency. You can request a *FREE* copy by emailing dave@nwcleanair.org.

9. Did each attendee of last year's TfS Symposium receive a copy of the walk-through DVD? I visited Grand Island Schools and they used it and were very well trained to do a walk-through.

YES, everyone who attended EPA's 7th Annual Indoor Air Quality Tools for Schools National Symposium did receive a free copy. See answer above if you would like a copy.

10. What level of CO_2 do you use as a standard?

Indoors, a fully occupied classroom mid-day with less than 1000 ppm CO_2 indicates you are getting the recommended 15 cfm per student of fresh outside air ventilation. This does not mean that 1500 or 2000 is a tragedy or emergency...but it could use improvement. Outdoor air is generally about 380 ppm...as fresh as air can get on the planet. If incoming air at your supply vents measures above 1000 ppm, obviously, it will not be able to dilute the air in the room. It's nice to see 600 ppm air or lower coming in at the supply vent. If the measurement in the middle of the room is the same as the measurement coming in at the supply vent, this is an indication that no fresh outside air is being added to the HVAC cycle at all...and those numbers will rise all day long with kids contributing 30,000 to 50,000 ppm CO_2 air with every exhaled breath.

11. How do you determine the direction of airflow?

We use titanium tetrachloride chemical smoke tube kits. My only source is the Energy Conservatory in Minnesota ($50 or so for a nearly lifetime supply of smoke in a bottle). The more expensive alternative is a digital micromanometer (differential pressure guage), also available from the Energy Conservatory and others.

12. **What would you estimate your service would cost for a contractor to conduct?**
Well, it depends on the costs of the individuals you hire to perform the walkthrough. Some States, like the state of Washington, have people on staff that can provide IAQ contractor like services free of charge. The experience level varies from state to state from office to office. A top notch IAQ consultant might charge $1500/day plus expenses. When hiring an IAQ consultant make sure you check references -- anyone can call themselves an IAQ expert. Estimate that a detailed walkthrough for an elementary school will take at least half a day, moving briskly, 5 minutes or so average per classroom, and a full day for a high school...assuming competent IAQ people with rapid response equipment. It will be slower for people feeling their way through the process, learning as they go, but then speeds up with experience.

13. Can Blue Valley share their radon resistant new construction detail with the Webinar notes?
For those new buildings that we design with a UFA (under floor air distribution) system, the space below the floor is the plenum space and is positively pressurized so radon cannot enter the building. To do so, it would have to overcome the air pressure under the floor, which it cannot. Other construction methods include a heavy mil vapor barrier below the floor slab inserted during the construction process.

Useful Resources Mentioned

Envisioning Excellence helps schools take effective action to advance health, safety, and wellness initiatives. ***Envisioning Excellence*** presents the Framework for Effective School IAQ Programs: Six Key Drivers -- guidelines that detail the organizational approaches and practices that are fundamental to school IAQ program success -- and presents five profiles in excellence to demonstrate how different school districts applied the Framework to create effective and enduring IAQ programs. Read about this exciting new tool at www.iaqsymposium.com/

The ***IAQ TfS*** **Action Kit** shows schools how to carry out a practical plan to improve indoor air problems at little- or no-cost using straightforward activities and in-house staff. The Kit provides best practices, industry guidelines, sample policies, and a sample IAQ management plan.

The Virtual School Walkthrough: Identifying & Solving Common IAQ Problems DVD, Developed by presenters Rich Prill and Dave Blake: dave@nwcleanair.org

EPA's Healthy Seat Program: www.epa.gov/schools

The 3-Step Region 10 IAQ Program: www.engergy.wsu.edu/projects/building/iaq.cfm

Fact Sheets: CO2, Mold, Cleaning: www.epa.gov/iaq